

Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance

January 1991



U.S. Department of Energy
Assistant Secretary for Environment,
Safety and Health
Washington, D.C. 20585

reference in both DOE Orders 5700.1 and 5700.5


this establishes elements of a radiological monitoring program in Support of 5800.1 and 5700.5

ADMIN RECORD

SW-A-005474

7.3.4 Less-Than-Detectable Values

Monitoring programs often include measurement of extremely low concentrations of radionuclides, below the detection limit of the counting instruments. Data sets with large numbers of less-than-detectable values need special consideration in the statistical analyses (Gilbert 1987).

Less-than-detectable data will produce numerical measurements with values below the detection limit and sometimes negative values. All of the actual values, including those that are negative, *should* be included in the statistical analyses. Practices such as assigning a zero, the detection limit value, or some in-between value to the below-detectable data point, or discarding those data points can severely bias the resulting parameter estimates and *should* be avoided. 

When analytical instruments or laboratories do not supply the actual values for readings less than the detection limit, but make some designation such as "ND," the actual values for those data points *should* be obtained. When obtaining these data points is not possible, at least the number of less-than-detectable values *should* be obtained. Data from censored distributions (for which the number of less-than-detectable values is known) are more amenable to standard statistical analyses than are those from truncated distributions (for which the number of values below the detection limit are not known), which require special statistical techniques (Gilbert and Kinnison 1981).

7.3.5 Testing for Outliers

An outlier is defined as an abnormally high or low data value. It can represent a true extreme value, or it can indicate data errors or equipment malfunctions or errors. It is important to compare each data point to previous data to determine whether the point is an outlier or a true data point that is to be included in the data set (Gilbert 1987).

Several statistical tests are available to test for outliers. Most of these tests assume a normal distribution, so data *should* be transformed to approximate the normal distribution before outlier tests are performed. Outliers can be identified qualitatively by adding the new data point to the data probability plot and noting if the point falls on an extreme end of the plot line; alternatively, a 2- or 3-standard-deviation probability ellipse can be constructed around a scatterplot of all of the data, with points falling outside of that ellipse considered outliers. These tests, while statistically valid (as long as their assumptions, e.g., normality, are met), determine only whether the new point is extreme with respect to the mean or median of the entire data set and do not detect temporal irregularities (for example, data values that are close to a yearly average but highly unusual for the season or time of day at which they occurred). Therefore, these tests are not adequate to serve as the sole justification for the inclusion or exclusion of data from the set. A better procedure that takes into consideration the temporal

United States Government

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memorandum

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REPLY TO
ATTN OF: Office of Air, Water and Radiation Protection Policy & Guidance (EH-41): Vázquez: 6-7629

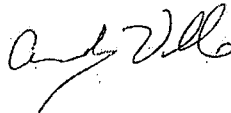
SUBJECT: Availability of Revised Chapter 4, *Meteorological Monitoring*, of Guide DOE/EH-0173T

TO: Distribution

This memo is to inform you of the availability of revised Chapter 4, *Meteorological Monitoring*, of guide DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*. The purpose of the guide is to support the implementation of radiological monitoring and surveillance activities needed for compliance with DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. The revision of Chapter 4 was made to be consistent with the revised American National Standards Institute (ANSI) standard ANSI/ANS-3.11-2000, "American National Standard for Determining Meteorological Information at Nuclear Facilities", and recent EPA guidance in EPA-454/R-99-005, "Meteorological Monitoring Guidance for Regulatory Modeling Applications," 1999. The revision of Chapter 4 was led by members of the DOE Meteorological Coordinating Council (DMCC); it was subsequently reviewed by Federal experts in meteorology and related sciences. Chapter 4 is available for download at our website (<http://www.eh.doe.gov/oepea>).

We are currently reviewing and revising other chapters of DOE/EH-0173T, as necessary, to respond to technical improvements and updated requirements since the Guide's original publication in 1991. Once these updates are complete, guide DOE/EH-0173T will be reissued under the current directives management system. In the interim, we recommend that the attached chapter be used in place of the existing Chapter 4.

If you have any questions on revised Chapter 4, or if you are interested in being part of a team being formed by our Office to update DOE/EH0173T, please contact Gustavo Vázquez (202/586-7629; gustavo.vazquez@eh.doe.gov), or Steve Domotor (202/586-0871; steve.domotor@eh.doe.gov).



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